C H A P T E R 9

Systems Theory

Chapter Outline

Sociology and Modern Systems Theory

Niklas Luhmann's General System Theory

Systems theory has adherents in many different fields, but it has had a checkered history in sociology (Baecker, 2001). As a result, if it were not for the work of the German social thinker Niklas Luhmann, this chapter would not be here. Over more than two decades until his death in 1998, Luhmann doggedly pursued the development of systems theory (he preferred "system theory"). (Although his work is not nearly as well known or influential, Kenneth Bailey [1990, 1994, 1997] also has been a notable contributor to the development of this theory.) For years Luhmann labored in virtual anonymity, but more recently his work has gained increasing worldwide recognition. As a result, this chapter is devoted largely to his thinking. However, before we get to his work, we will discuss some early insights and conceptual ideas from the work of Walter Buckley (1967), especially his *Sociology and Modern Systems Theory.*

Sociology and Modern Systems Theory

Gains from Systems Theory

A central issue addressed by Buckley is what sociology has to gain from systems theory. First, because systems theory is derived from the hard sciences and because it is, at least in the eyes of its proponents, applicable to *all* behavioral and social sciences, it promises a common vocabulary to unify those sciences. Second, systems theory is multileveled and can be applied equally well to the largest-scale and the smallest-scale, to the most objective and the most subjective, aspects of the social world. Third, systems theory is interested in the varied relationships of the many aspects of the social world and thus operates against piecemeal analyses of the social world. The argument of systems theory is that the intricate relationship of parts cannot be treated out of the context of the whole. Systems theorists reject the idea that society or other large-scale components of society should be treated as unified social facts. Instead, the focus is

on relationships or processes at various levels within the social system. Buckley described the focus:

> The kind of system we are interested in may be described generally as a complex of elements or components directly or indirectly related in a causal network, such that each component is related to at least some others in a more or less stable way within any particular period of time.
>
> (Buckley, 1967:41)

Richard A. Ball (see also Bailey, 2005) offers a clear conception of the relational orientation of systems theory, or what he calls General Systems Theory (GST):

> GST begins with a processual conception of reality as consisting fundamentally of relationships among relationships, as illustrated in the concept of "gravity" as used in modern physics. The term "gravity" does not describe an entity at all. There is no such "thing" as gravity. It is a *set of relationships.* To think of these relationships as entities is to fall into reification. . . . The GST approach demands that sociologists develop the logic of relationships and conceptualize social reality in relational terms.
>
> (Ball, 1978:66)

Fourth, the systems approach tends to see all aspects of sociocultural systems in process terms, especially as networks of information and communication. Fifth, and perhaps most important, systems theory is inherently integrative. Buckley, in his definition of the perspective, saw it involving the integration of large-scale objective structures, symbol systems, action and interaction, and "consciousness and self-awareness." Ball also accepted the idea of integration of levels: "The individual and society are treated equally, not as separate entities but as mutually constitutive fields, related through various 'feedback' processes" (1978:68). In fact, systems theory is so attuned to integration that Buckley criticized the tendency of other sociologists to make analytical distinctions among levels:

> We note the tendency in much of sociology to insist on what is called an "analytical distinction" between "personality" (presumably intracranial), symbol systems (culture), and matrices of social relations (social systems), though the actual work of the proponents of the distinctions shows it to be misleading or often untenable in practice.
>
> (Buckley, 1967:101)

(Buckley was somewhat unfair here because he did much the same thing throughout his own work. Making analytical distinctions is apparently acceptable to systems theorists as long as one is making such distinctions in order to make better sense out of the interrelationships among the various aspects of social life.) Finally, systems theory tends to see the social world in dynamic terms, with an overriding concern for "sociocultural emergence and dynamics in general" (Buckley, 1967:39).

Some General Principles

Buckley discussed the relationship among sociocultural systems, mechanical systems, and organic systems. Buckley focused on delineating the essential differences among these systems. On a number of dimensions a continuum runs from mechanical systems to organic systems to sociocultural systems—going from least to most complexity of the parts, from least to most instability of the parts, and from lowest to highest degree to which the parts are attributable to the system as a whole.

On other dimensions, the systems differ qualitatively rather than simply quantitatively. In mechanical systems, the interrelationships of the parts are based on transfers of energy. In organic systems, the interrelationships of the parts are based more on exchange of information than on exchange of energy. In sociocultural systems, the interrelationships are based even more on information exchange.

The three types of systems also differ in the degree to which they are open or closed—that is, in the degree of interchange with aspects of the larger environment. A more open system is better able to respond selectively to a greater range and detail of the endless variety of the environment. In these terms, mechanical systems tend to be closed, organic systems are more open, and sociocultural systems are the most open of the three (as we will see, Luhmann disagrees with the last point). The degree of openness of a system is related to two crucial concepts in systems theory: *entropy,* or the tendency of systems to run down, and *negentropy,* or the tendency of systems to elaborate structures (Bailey, 1990). Closed systems tend to be entropic, whereas open systems tend to be negentropic. Sociocultural systems also tend to have more tension built into them than do the other two. Finally, sociocultural systems can be purposive and goal-seeking because they receive feedback from the environment that allows them to keep moving toward their goals.

Feedback is an essential aspect of the cybernetic approach that systems theorists take to the social system. This is in contrast to the equilibrium approach, which is characteristic of many sociologists (for instance, Parsons) who purportedly operate from a systems approach. Using feedback enables cybernetic systems theorists to deal with friction, growth, evolution, and sudden changes. The openness of a social system to its environment and the impact of environmental factors on the system are important concerns to these systems theorists (Bailey, 2001).

A variety of internal processes also affect social systems. Two other concepts are critical here. *Morphostasis* refers to those processes that help the system maintain itself, whereas *morphogenesis* refers to those processes that help the system change and grow more elaborate. Social systems develop more and more complex "mediating systems" that intervene between external forces and the action of the system. Some of these mediating systems help the system maintain itself, and others help it change. These mediating systems grow more and more independent, autonomous, and determinative of the actions of the system. In other words, these mediating systems permit the social system to grow less dependent on the environment.

These complex mediating systems perform a variety of functions in the social system. For example, they allow the system to adjust itself temporarily to external conditions. They can direct the system from harsh to more congenial environments. They also can allow the system to reorganize its parts in order to deal with the environment more effectively.

Applications to the Social World

Buckley (1967) moved from a discussion of general principles to the specifics of the social world to show the applicability of systems theory. He began at the individual level, where he was very favorably impressed by Mead's work, in which

consciousness and action are interrelated. In fact, Buckley recast the Meadian problematic in systems-theory terms. Action begins with a *signal* from the environment, which is transmitted to the actor. However, the transmission may be complicated by *noise* in the environment. When it gets through, the signal provides the actor with *information.* On the basis of this information, the actor is allowed to *select* a response. The key here is the actor's possession of a mediating mechanism—self-consciousness. Buckley discussed self-consciousness in the terminology of systems theory:

> In the language of cybernetics, such self-consciousness is a mechanism of internal feedback of the system's own states which may be mapped or compared with other information from the situation and from memory, permitting a selection from a repertoire of actions in a goal-directed manner that takes one's own self and behavior implicitly into account.
>
> (Buckley, 1967:100)

To Mead and the symbolic interactionists and systems theorists, consciousness is not separated from action and interaction but rather is an integral part of both.

Despite his views that consciousness and interaction are interrelated and that levels should not be separated, Buckley did move from consciousness to the interactional domain. Patterns of interaction—namely, imitation and response—clearly fit into a systemic view of the world. More important, Buckley tied the interpersonal realm directly to the personality system; indeed, he saw the two as mutually determinative. Finally, Buckley turned to the large-scale organization of society, especially roles and institutions, which he saw in systemic terms and as being related to, if not indistinguishable from, the other levels of social reality.

Buckley concluded by discussing some of the general principles of systems theory as they apply to the sociocultural domain. First, the systems theorist accepts the idea that tension is a normal, ever-present, and necessary reality of the social system. Second, there is a focus on the nature and sources of variety in the social system. The emphasis on both tension and variety makes the systems perspective a dynamic one. Third, there is a concern for the selection process at both the individual and the interpersonal levels whereby the various alternatives open to the system are sorted and sifted. This lends further dynamism. Fourth, the interpersonal level is seen as the basis of the development of larger structures. The transactional processes of exchange, negotiation, and bargaining are the processes out of which emerge relatively stable social and cultural structures. Finally, despite the inherent dynamism of the systems approach, there is a recognition of the processes of perpetuation and transmission. As Buckley put it, "Out of the continuous transactions emerge some relatively stable accommodations and adjustments" (1967:160).

An interesting note: There are a number of rather striking similarities between systems theory and the dialectical approach, even though they are derived from extremely different sources (one scientific, the other philosophical) and have very different vocabularies (Ball, 1978). Similarities between them include a focus on relations, process, creativity, and tension.

Niklas Luhmann's General System Theory[1]

The most prominent systems theorist in sociology is Niklas Luhmann (1927–1998) (Nollman, 2005a; Rogowski, 2007). Luhmann developed a sociological approach that combined elements of Talcott Parsons's structural functionalism (see Chapter 7) with general systems theory and introduced concepts from cognitive biology, cybernetics, and phenomenology (Paul, 2001). Luhmann sees Parsons's later ideas as the only general theory that is complex enough to form the basis for a new sociological approach that reflects the latest findings in biological and cybernetic systems. However, he sees two problems with Parsons's approach. First, it has no place for *self-reference,* and according to Luhmann, society's ability to refer to itself is central to our understanding of it as a system. Second, Parsons does not recognize *contingency.* As a result, Parsons cannot adequately analyze modern society as it is because he does not see that it could be otherwise. Thus, to take one example from Parsons's work, the AGIL scheme (see Figure 7.1) should not be seen as a fact but instead as a model of possibilities. For example, the AGIL scheme shows that the adaptive and the goal-attainment subsystems can be related in various ways; therefore, the aim of analysis should be to understand why the system produced a particular relationship between these two subsystems at any given time. Luhmann addresses these two problems in Parsons's work by developing a theory that takes self-reference as central to systems and that focuses on contingency, the fact that things could be different.

The key to understanding what Luhmann means by a system can be found in the distinction between a system and its environment. Basically, the difference between the two is one of *complexity.* The system is always less complex than its environment. For example, a business, such as an automobile manufacturer, can be seen as a system that deals with a highly complex environment that includes many different types of people, a constantly changing physical environment, and many other diverse systems.[2] However, this complexity is represented in a much simplified form within the system. When the manufacturer needs raw materials (steel, rubber, etc.), it doesn't normally care where they come from, how they are produced, and the nature of their suppliers. All this complexity is reduced to information about the price and the quality of the raw materials. Similarly, all the diverse practices of its customers are reduced to those that have a direct impact on whether they buy a car.

Simplifying complexity means being forced to select (the manufacturer cares about how raw materials are produced but may not pay attention to the political situation in the nation in which they are produced). Being forced to select means contingency because one could always select differently (the manufacturer *could* monitor the political situation). And contingency means *risk.* Thus, if the manufacturer chooses not to monitor the political situation in the nation producing the raw material, the production process may be severely disrupted by a rebellion that shuts off the supply of that material.

---

[1] This section was coauthored with Doug Goodman and Matthias Junge.

[2] Strictly speaking, the automobile industry is not an autopoietic system in Luhmann's sense, because it is not producing its own basic elements. However, we will use this example to explain the general idea of systems theory because it is more concrete than the abstractions of the economic system or the law system. Later, when we define an autopoietic system, we will need to use a more abstract example.

A system simply cannot be as complex as its environment. A system that tried would bring to mind the Borges (1964) story about the king who ordered a cartographer to create a completely accurate map of his country. When the cartographer was done, the map was as big as the country and was therefore useless as a map. Maps, like systems, must reduce complexity. The cartographer must select what features are important. Different maps of the same area can be made because the selection is contingent. This is always necessary, but it is also risky because the map maker can never be sure that what is left out will not be important to the user.

Although they can never be as complex as their environment, systems develop new subsystems and establish various relations between the subsystems in order to deal effectively with their environment. If they did not, they would be overwhelmed by the complexity of the environment. For example, an automobile manufacturer could create a department of international affairs charged with monitoring political conditions in supplying nations. This new department would be responsible for keeping manufacturing apprised of potential disruptions in the supply of raw materials and for finding alternative sources in case of a disruption. Thus, paradoxically, "Only complexity can reduce complexity" (Luhmann, 1995:26).

Autopoietic Systems

Luhmann is best known for his thinking on autopoiesis.[3] The concept of autopoiesis refers to a diversity of systems from biological cells to the entire world society. Luhmann uses the term to refer to such systems as the economy, the political system, the legal system, the scientific system, and bureaucracies, among others. The description that follows includes variety of examples to give a sense of the scope of the concept. Autopoietic systems have the following four characteristics.

1. An autopoietic system produces the basic elements that make up the system. This may seem paradoxical. How can a system produce its own elements, the very things out of which it is made? Think of a modern economic system and its basic element, money. We say money is a basic element because the value of things in the economic system can be given in terms of money, but it is very difficult to say what money itself is worth. The meaning of money, what it is worth, and what it can be used for are determined by the economic system itself. Money, as we understand the term today, did not exist before the economic system. Both the modern form of money and the economic system emerged together, and they depend on each other. A modern economic system without money is difficult to imagine. Money without an economic system is just a piece of paper or metal.

2. Autopoietic systems are self-organizing in two ways—they organize their own boundaries, and they organize their internal structures. They organize their own boundaries by distinguishing between what is in the system and what is in the environment. For example, the economic system counts anything that is scarce and on which a price can be set as part of the economic system. Air is everywhere in abundant supply; therefore, no price is set on it and it is not part of the economic system. Air is, however,

[3] On the significance of this concept, see Zinn (2007b) and K. Bailey (1998).

a necessary part of the environment. What is inside or outside an autopoietic system is determined by the self-organization of the system, not, as a structural functionalist would have us believe, by the functional necessities of the system.

Other forces may try to limit the scope of autopoietic systems. For example, capitalist economic systems have always expanded their boundaries in order to include sex and illicit drugs. This occurs even though the political system passes laws aimed at keeping sex and illicit drugs from becoming economic commodities. Rather than keeping them out of the economic system, such laws instead affect the prices of sex and illicit drugs *within* the economic system. Their illegality makes their prices higher, thereby discouraging their purchase. But within the economic system, the high prices that discourage purchases also encourage sales. If a great deal of money can be made from selling sex and drugs, they will remain in the economic system. Therefore, laws that try to keep a commodity out of the economic system simply affect the way that commodity is priced within the economic system.

Within its boundaries, an autopoietic system produces its own structures. For example, because of the existence of money, the market is structured in an impersonal way, banks are established to store and lend money, the concept of interest has developed, and so on. If the economic system did not have as its basic element such an abstract and portable entity, the internal structure would be entirely different. For example, if the economy were based on barter instead of money, there would be no banks and no concept of interest, and the market where goods are bought and sold would be structured in an entirely different way.

3. Autopoietic systems are self-referential (Esposito, 1996). For example, the economic system uses price as a way of referring to itself. By attaching a fluctuating monetary value to shares in a company, the stock market exemplifies such self-reference within the economic system. The prices in the stock market are determined not by any individual, but by the economy itself. Similarly, the legal system has laws that refer to the legal system: laws about how laws can be enacted, applied, interpreted, and so on.

4. An autopoietic system is a closed system. This means that there is no direct connection between a system and its environment. Instead, a system deals with its representations of the environment. For example, the economic system supposedly responds to the material needs and desires of people; however, those needs and desires affect the economic system only to the extent that they can be represented in terms of money. Consequently, the economic system responds well to the material needs and desires of rich people but very poorly to the needs and desires of poor people.

Another example would be a bureaucracy, such as the Internal Revenue Service. The IRS never really deals with its clients; it deals solely with representations of the clients. Taxpayers are represented by the forms that they file and that are filed about them. The real taxpayer has an effect on the bureaucracy only by causing a disturbance in the bureaucracy's representations. Those who cause disturbances (misfiled forms, contradictory forms, false forms) often are dealt with very harshly because they threaten the system.

Even though an autopoietic system is closed with no direct connection to the environment, the environment must be allowed to disturb its inner representations.

Without such disturbances, the system would be destroyed by environmental forces that would overwhelm it. For example, the prices of stocks in the stock market fluctuate daily. The difference between the price of a company's stock from one day to the next has little to do with the real value of the company—that is, its assets or profits—and everything to do with the state of the stock market. That is, the market may be in a boom period (a "bull" market) in which the prices of stocks are far higher than they should be given the state of the companies involved. However, over the long run the price of stocks needs to reflect the actual status of the companies involved or the system will fall apart. This is what happened in the stock market crash of 1929. The prices of stocks had no relation to real value, and so the system reached a state of crisis. To function properly, the stock market as a system must, at least at times, be disturbed by the actual condition of the companies that are part of its environment.

A closed social system is distinct from the individuals who appear to be part of it. According to Luhmann, in such systems, the individual is part of the environment. To take the example of a bureaucracy again, this means that not only are the clients part of the environment, so are the people who work in the bureaucracy. From the perspective of the bureaucracy, the people who work in it are external sources of complexity and unpredictability. In order to be a closed system, the bureaucracy must find a way to represent even its own workers in a simplified way. Thus, instead of being seen as full-fledged human beings, one worker is seen as a "manager," another as an "accountant," and so on. The real, fully human worker affects the bureaucracy only as a disturbance to the bureaucracy's representations.

Society and Psychic Systems

Luhmann argues that society is an autopoietic system. It fulfills the four characteristics listed above—society produces its own basic elements, it establishes its own boundaries and structures, it is self-referential, and it is closed.

The basic element of society is communication, and communication is produced by society. Participants in society refer to society through communication. In fact, that is what we are doing right now! The individual is relevant to society only to the extent that he or she participates in communication or can be interpreted as participating in a communication. Those secret parts of you that are never communicated, or not understood as a communication by others, are not part of society. They are, instead, part of the environment that may disturb society. According to Luhmann's conception, whatever is not communication is part of society's environment. This includes the biological systems of human beings and even their psychic systems. The individual as a biological organism and the individual as consciousness are not part of society but are external to it. This leads to the strange idea that the individual is *not* part of society.

By the psychic system, Luhmann means the consciousness of the individual. The psychic system and society—the system of all communications—have a property in common. They both rely on *meaning*. Meaning is closely related to the choices that a system makes. The meaning of a particular action (or object) is its difference from other possible actions (or objects). Meaning appears only against the backdrop

of contingency. If there is no possibility of being different, then there is no meaning. Action has meaning only to the extent that a selection is made from among a range of possible actions. For example, our clothing means something only because we could have chosen to wear something else.

Systems such as the psychic and social systems that rely on meaning are closed because (1) meaning always refers to other meaning, (2) only meaning can change meaning, and (3) meaning usually produces more meaning. Meaning forms the boundary to each of these systems. For example, in the psychic system, what is not meaningful is seen as outside the system, as a "cause" of our action, whereas what is meaningful is inside the system and seen as a "motivation" for our action. Events enter our psychic systems only as meaning. Even our own bodies are simply environments for this meaning system. Our bodies can be seen only as disturbances to our psychic systems. The body enters our consciousness by becoming meaningful, so that, for example, a physical agitation enters consciousness as an emotion. Similarly, in the social system, meaning is the difference between a communication within the system and noise from outside the system.

Psychic systems and social systems have evolved together. Each is a necessary environment for the other. The elements of the psychic meaning system are conceptual representations; the elements of the social meaning system are communications. It would be wrong to think that meaning in the psychic system has priority over meaning in the social system. Because both are autopoietic systems, they both produce their own meanings out of their own processes. In the psychic system, meaning is bound to consciousness, whereas in the social system it is bound to communication. Meaning in the social system cannot be ascribed to an individual's intention, nor is it a property of the particular elements of the social system; instead it refers to a selection from among the elements. The meaning of what is communicated is derived from its difference from what could be communicated. For example, "Hello," "What's up?" "How ya doin'," "Good day," and "Hey!" may all come from the same intention—that is, to greet someone—but if a friend says "Good day" when she usually says "Hey!" some meaning would be communicated. The meaning is not necessarily intended, nor is it connected to the particular words. The meaning comes from the selection of *those particular words* in comparison to the words that could have been selected. The meaning comes from the contingency of those selected words.

Double Contingency

The social system based on communication creates social structures in order to solve what Luhmann calls the problem of double contingency.[4] Double contingency refers to the fact that every communication must take into consideration the way that it is received. But we also know that the way that it is received will depend on the receiver's estimation of the communicator. This forms an impossible circle: the receiver depends on the communicator, and the communicator depends on the receiver.

---

[4] Parsons (1951) also dealt with the problem of double contingency, but he limits its solution to a preexisting value consensus. Luhmann acknowledges the possibility that a new value consensus can be created on the spot (Vanderstraeten, 2002).

For example, a professor, in choosing how to greet a student, might use the informal "Hey!" if she thinks it will appear more friendly (the communicator takes into account the receiver). But if the student being greeted thinks the professor is talking down to him, he will not see it as a friendly gesture (the receiver takes into account the communicator). The less we know about each other's expectations, the greater is the problem of double contingency.

Fortunately, we almost always know a great deal about others' expectations because of social structures. In the example above, we know that the people involved are a professor and a student. Based on this alone, we expect that they will have a certain type of relationship that conforms to institutional rules and traditions. We will have other expectations by knowing their genders, their ethnicities, their ages, their dress, and so on. Because of these expectations, norms and role expectations develop for interpreting people's communications. Either people fit the norms and role expectations or they do not. If we find a number of examples that do not fit our expectations, our expectations may change, but society can never do without these expectations because of the problem of double contingency.

It is because each of us has a different set of norms that communication becomes necessary, and it is because communication has the problem of double contingency that we develop sets of norms. This shows how society as an autopoietic system works: the structure (roles, institutional and traditional norms) of society creates the elements (communication) of society and those elements create the structure, so that, as in all autopoietic systems, the system constitutes its own elements.

Because of double contingency, any given communication is improbable. First, it is improbable that we would have something we want to communicate to a particular person. Second, because the information can be communicated in a number of ways, it is improbable that we will choose any one particular way. Third, it is improbable that the person we are addressing will understand us correctly. Social structures have developed in order to make improbable communications more probable. For example, to say "Good day" to a particular person at any particular time is an improbable thing, but social structures make a greeting normative in certain circumstances, they provide us with a limited number of acceptable ways to greet people, and they make sure that the addressee will understand the greeting in approximately the same way that the addressor intends it.

The improbabilities that we've discussed so far refer only to interactions, but society is more than a collection of independent interactions. Interactions last only as long as the people involved in the communication are present, but, from the viewpoint of society, interactions are episodes in ongoing social processes. Every social system is faced with a problem: it will cease to exist if there is no guarantee of further communications, that is, no possibility of connecting previous communications to future communications. To avoid a breakdown of communication, structures must be developed to permit earlier communications to connect with later communications. The selections made in one communication are restricted by the selections made in previous communications, and the present communication also restricts future communications. This is another way in which the improbabilities of the communicative process are overcome and transformed into probabilities by the social

system. It is this need to overcome double contingency and make improbable communications more probable that regulates the evolution of social systems.

Evolution of Social Systems

Evolution is, roughly speaking, a process of trial-and-error. Evolution is not teleological. Its outcomes are not governed by a predefined goal. One implication is that, in Luhmann's theory, the idea of progress makes no sense. This differentiates it from Parsons's idea of evolutionary universals in modern societies (see pp. 249–251). To assume a necessary path of societal development is teleological and ignores the fact that there are a variety of ways of dealing with a given problem.

On the general level, evolution makes improbability more probable. For example, it is improbable that a random set of biological mutations will produce a given animal such as a human. Natural selection and the inheritance of stable characteristics make it more probable that an ape will evolve into something like a human rather than something like a squid.

Strictly speaking, evolution is not a process but a set of processes that can be described as performing three functions: variation, selection, and stabilization of reproducible characteristics. These functions represent the concrete mechanisms by which evolution operates. *Variation* is a process of trial-and-error. If a system faces a unique problem, a variety of solutions may develop to deal with the environmental disturbance. Some of these solutions will work, and others will not. The *selection* of a particular solution does not imply that the "best" solution is chosen. It may simply be that the particular solution is the easiest to stabilize, in other words, the easiest to reproduce as a stable and enduring structure. In a social system, this *stabilization* usually involves a new kind of differentiation that requires the adjustment of all the parts of the system to the new solution. The evolutionary process will have achieved a temporary end only when the stabilization phase is complete.

Let us take an example from the economy. One problem that economic systems have faced is how to exchange goods in an equitable way with other economic systems—that is, how can an economy that uses dollars exchange goods with an economy that uses yen? A variety of different solutions have developed (evolutionary variation). Some early systems initiated "gift" exchanges that eliminated a concern for the exact equality of the goods exchanged. Others used a stable commodity such as gold to regulate the interchange. Both of these solutions proved difficult to reproduce on a global scale. For the first solution, only so much can be exchanged as gifts, and for the second, the value of commodities such as gold do not remain stable because more or less gold is available at any given time. Instead, a more reproducible form has been the establishment of a new structure, a currency exchange market, that operates at the global level and allows the exchange rate of currencies to float (evolutionary selection). This may not be the best solution because it is susceptible to wild fluctuations caused by speculators, as seen in the "Asian" financial crisis of 1998. However, it is the only solution that appears to be reproducible on a global scale (evolutionary stabilization). Of course, the reproducibility of this solution does not mean that the other solutions have disappeared. States still exchange gifts, especially with heads of state

through diplomats, and many countries try to fix their exchange rates by tying them to a commodity such as gold or even another currency such as the U.S. dollar.

Differentiation

From the viewpoint of Luhmann's system theory, the principal feature of modern society is the increased process of system differentiation as a way of dealing with the complexity of its environment (Rasch, 2000; Vanderstraeten, 2005). Differentiation is the "replication, within a system of the difference between a system and its environment" (Luhmann, 1982b:230).[5] This means that in a differentiated system there are two kinds of environments: one common to all subsystems and a different *internal environment* for each subsystem. For example, an automobile manufacturer, such as Ford, sees other manufacturers, General Motors and DaimlerChrysler, for instance, as part of its environment. The international relations department (a subsystem) of Ford also sees General Motors and Chrysler as outside it and part of its environment. However, the international relations department also sees other subsystems within Ford (such as the human relations department [subsystem]) as outside the international relations subsystem and therefore part of its environment. Other subsystems, such as the human relations department, are internal to the organizational system as a whole, but are in the environment of the international relations subsystem, hence an internal environment. Similarly, the human relations subsystem sees other manufacturers as part of its environment, but in addition sees other subsystems (this time including the international relations subsystem) as part of its environment. Therefore, each of the subsystems has a different view of the internal environment of the system. This creates a highly complex and dynamic internal environment.

Differentiation within a system is a way of dealing with changes in the environment. As we have seen, each system must maintain its boundary in relation to the environment. Otherwise it would be overwhelmed by the complexity of its environment, break down, and cease to exist. In order to survive, the system must be able to deal with environmental variations. For instance, it is well known that any large-scale organization as a system adjusts slowly to alterations in its environment (such as to concrete demands by the public, political changes, or even technological changes such as the availability of personal computers). However, organizations do develop; they evolve by creating differentiation within the system. That is, an environmental change will be "translated" into the structure of the organization. An example would be the creation by the automobile manufacturer of a new department to deal with a new situation such as the presence of personal computers in the workplace. New workers would be hired, they would be trained to handle the new technology, a manager would be selected, and so forth.

The differentiation process is a means of increasing the complexity of the system, because each subsystem can make different connections with other subsystems. It allows for more variation within the system in order to respond to variation in the environment. In the example above, the new department is, like every other department

[5] For a general discussion of differentiation and the limits of the concept, see G. Wagner (1998).

of the bureaucratic system, an environment for other departments, but the new one increases organizational complexity because new and additional relations between departments are made possible. A new department created to service workers' computers will be better able to respond to further changes in computer technologies and help the entire organization integrate these new capabilities. In addition, it may provide for new connections between existing departments, such as allowing general accounting to be centralized or salespeople to access inventory directly.

Not only does more variation caused by differentiation allow for better responses to the environment, it also allows for faster evolution. Remember that evolution is a process of selection from variation. The more variation that is available, the better is the selection. However, Luhmann argues that only a few forms of internal differentiation have developed. He calls these segmentation, stratification, center-periphery, and functional differentiation. These differentiations increase the complexity of the system through the repetition of the differentiation between system and environment within the system. In terms of their evolutionary potential, these forms of differentiation have a different ability to produce variability and therefore provide for more selectivity for evolutionary processes. The more complex forms of differentiation therefore have the potential to accelerate the evolution of the system.

Segmentary Differentiation

Segmentary differentiation divides parts of the system on the basis of the need to fulfill identical functions over and over. For instance, our automobile manufacturer has functionally similar factories for the production of cars at many different locations. Every location is organized in much the same way; each has the same structure and fulfills the same function—producing cars.

Stratificatory Differentiation

Stratificatory differentiation is a vertical differentiation according to rank or status in a system conceived as a hierarchy. Every rank fulfills a particular and distinct function in the system. In the automobile firm, we find different ranks. For example, the manager of the new department of international relations occupies the top rank within the hierarchy of that department. The manager has the function of using power to direct the operations of that department. Then there are a variety of lower-ranking workers within the department who handle a variety of specific functions (e.g., word processing). In addition, the manager of the department of international relations has a position within the stratificatory system of the automobile manufacturer. Thus, the president of the company has a higher-ranking position than that of the manager of international relations and is in a position to issue orders to the latter.

In segmentary differentiation, inequality results from accidental variations in environments (such as more cars being sold in one geographic area than in another), but it has no systemic function. In stratificatory differentiation, however, inequality is essential to the system. More correctly, we see the interplay of equality and inequality. All members in the same ranks (e.g., all the word processors) are basically equal, while different ranks are distinguished by their inequality. The higher ranks

(e.g., department managers) have more access to resources and a greater ability to become the subject of influential communications. Consequently, a stratified system is more concerned with the well-being of those in the upper ranks and generally is concerned about the lower ranks only if they threaten the higher ranks. However, both ranks depend on one another, and the social system can survive only if all ranks, including the lowest, successfully realize their functions.

The importance of the lower ranks and their difficulty in becoming the subject of influential communication create a structural problem that limits the complexity of the system. When those directing the system become too far removed from the lowest ranks, the system tends to collapse because the important functions of the lowest ranks are not being performed properly. In order to have an effect on the system, the lower ranks must resort to conflict.

Center-Periphery Differentiation

The third type of differentiation, that between *center and periphery,* is a link between segmentary and stratificatory differentiation (Luhmann, 1997:663–678). For instance, some automobile firms have built factories in other countries; nevertheless, the headquarters of the company remains the center, ruling and, to some extent, controlling the peripheral factories.[6]

Differentiations of Functional Systems

Functional differentiation is the most complex form of differentiation and the form that dominates modern society. Every function within a system is ascribed to a particular unit. For instance, an automobile manufacturer has functionally differentiated departments such as production, administration, accounting, planning, and personnel.

Functional differentiation is more flexible than stratificatory differentiation is, but if one system fails to fulfill its task, the whole system will have great trouble surviving.[7] However, as long as each unit fulfills its function, the different units can attain a high degree of independence. In fact, functionally differentiated systems are a complex mixture of interdependence and independence. For instance, while the planning division is dependent on the accounting division for economic data, as long as the figures are accurate, the planning division can be blissfully ignorant of exactly how the accountants produced the data.

This indicates a further difference between the forms of differentiation. In the case of segmentary differentiation, if a segment fails to fulfill its function (e.g., one of the automobile manufacturer's factories cannot produce cars because of a labor strike), it does not threaten the system. However, in the case of the more complex forms of differentiation such as functional differentiation, failure will cause a problem

---

[6] It has been objected (Schimank, 1996) that this distinction does not fit Luhmann's general argument. The differentiation between center and periphery does not refer to the social system as a whole. Rather, in the example above it refers to a differentiation of functions within the industrial system. Thus it refers to a specific system within the social system and does not refer to the social system as a whole.

[7] Most of the systems discussed here also can be called subsystems of the world social system. However, we will use the term *system* rather than *subsystem* except when it is necessary to distinguish between the subsystem and the overarching system that contains it.

for the social system, possibly leading to its breakdown. Thus, on the one hand, the growth of complexity increases the abilities of a system to deal with its environment. On the other hand, complexity increases the risk of a system breakdown if a function is not properly fulfilled.

However, in most cases, this increased vulnerability is a necessary price to pay for the increase in possible relations between different subsystems. Having more types of possible relations between the subsystems means more variation to use to select structural responses to changes in the environment. In a segmentary system, the relations between different subsystems are not structurally different. For example, the relations that any two factories have with each other are all basically the same. In a stratified system, the relations between ranks are basically different from those within the rank. For example, the relation that a factory has with headquarters is different from that which it has with another factory. In functionally differentiated systems, the different relations multiply. The accounting and production departments have a relationship with each other that is different from that between accounting and research, which is, in turn, different from the relationship between production and research. Functional differentiation gives the automobile manufacturer greater flexibility. Thus, for example, in an environment in which technical advances are providing opportunities for economic advantage, the company can be led by research, but in an environment in which economic advantage is found in doing the same old thing, only cheaper, the company can be led by accounting.

We should note that the more complex forms of differentiation do not exclude the less complex forms, and, in fact, they may require the less complex forms. For example, an automobile manufacturer is stratified, but it still contains individual factories that are a segmentary form. This is important, because we usually speak of functionally differentiated systems within modern society to describe its dominant mode of differentiation; nevertheless, the other forms continue to exist.

Code

A code is a way to distinguish elements of a system from elements that do not belong to the system. A code is the basic "language" of a functional system. Codes are, for instance, truth (versus nontruth) for the science system, payment (versus nonpayment) for the economic system, and legal (versus illegal) for the legal system. Every communication using a particular code is a part of the system whose code reference is being used.

A code is used to limit the kind of permissible communication. Every communication that does not use the code is not a communication belonging to the system under consideration. Thus, within the scientific system we usually find only communications with reference to the code of truth. For instance, if the head of NASA (National Aeronautics and Space Administration) and the head of NIH (National Institutes of Health) met to discuss what facts had been discovered about aging in John Glenn's 1998 space flight, it would be part of the scientific system using the code of truth or nontruth. If the same people met to discuss who would pay for what part of the research conducted on that space flight, it would be in the economic system using the code of payment or nonpayment.

In Luhmann's system theory, no system uses and understands the code of another system. There is no way to translate the code of one system into the code of another system. Because the systems are closed, they can react only to things happening in their environment (if what happens makes enough "noise" to be noticed by the system). But the system must describe the noise in the environment in relation to its own code. This is the only way to make sense of what is happening, the only way to give it meaning. For example, an economic system will "see" a scientific system only in terms of what makes money (makes future payments possible) or requires investments (requires initial payments before it can be repaid).

Problems of Functional Differentiation

Functional differentiation causes at least one central problem for modern society. What is necessary for society as a whole may not be dealt with by any functional system. There may not be a functional system that has a code that can represent the problem adequately. For instance, the economic system cannot adequately represent ecological problems, because much pollution looks economically rational. The legal system may have laws aimed at restricting air pollution, but those laws are interpreted within the economic system of the polluters. This is demonstrated by an example from the former Czechoslovakia, where there were legally prescribed limitations on air pollution. Industries reacted to those laws by building higher smokestacks, leading to a wider dispersion of pollution and thus a decreasing level of air pollution near the measurement points. This reaction contradicted the intention of the law, but it was a reaction in accord with the code of the economic system; it was a way to minimize costs. Better protection against air pollution would have cost much more than building higher smokestacks.

Such problems generally are caused by functional differentiation. Functional differentiation requires a displacement of problems from the level of society to the level of subsystems. Every subsystem has gained independence and flexibility in making decisions using its own codes. However, each is dependent on other subsystems to move the social system as a whole. In short, the result of greater independence of functional systems is greater vulnerability of the social system as a whole.

Luhmann investigated the problematic relationship between the functional differentiation of modern society and its efforts to deal with the problems of ecology (1986/1989). Modern society has no specific differentiated system to deal with ecological problems. Everything that happens in its environment (note the double meaning of the term: environment of a system and natural environment) must be treated within the existing functional systems and their codes. That means that every problem in the environment is a problem for a system only if it can be represented in that system's code. For example, the law can move against polluters only if what they do can be represented as illegal. Thus, it is possible that ecological problems will not be dealt with sufficiently. Of greater importance is a general conclusion: functional differentiation can be conceived of as a causative factor of ecological crisis (Luhmann, 1986/1989:42).

Functional systems produce both too much and too little *resonance* to problems in their environment. Too little resonance means that a system does not react well to

problems that cannot be represented by its codes. For instance, environmental groups may confront the automobile industry with a demand for cars that produce less air pollution; however, the automobile industry is unlikely to react to those demands unless the protests start to affect their profits. Too much resonance means that the treatment of ecological problems within a functional system may lead to reactions in other functional systems because the systems are interdependent. For instance, the automobile industry may produce cars that pollute less by making them smaller, lighter, and, consequently, cheaper. This can have the consequence that the development of the public transportation system will slow down because now everyone can buy a car. In addition, it is likely that this also will increase the number of traffic accidents and thus the cost within the health system. The reaction to the demand of the environmental groups has unpredictable consequences within complex interdependent functional systems.

Luhmann's Sociology of Knowledge

For Luhmann, the principal question for sociology is: What is society? This was the starting point of Luhmann's attempt to develop a system theory (1987). Sociology, as a science of society, is possible only with a clearly defined concept of society. Luhmann's system theory defines *society* as the "all encompassing social system including all other societal systems" (1997:78; translated by one of the authors). This implies that the concept of *society* is identical to the concept of a *world society;* there can be only one society. A *social system* is every system producing communication as its basic element to reproduce itself. A *societal system* is a functional system like the economy, science, and law within the all-encompassing system of society.[8]

An all-encompassing world society has no boundaries in time and space; in a sense, a world society has no "address" and no other societies in the environment. How, then, can society be observed? There is only one answer: A society can be observed only from a perspective within society, that is, through a functional system of society. However, no functional system has the "right" perspective for the observation of society. Every perspective is a legitimate one. How can we then arrive at a single way of gaining information about the social world? In fact, there is no way to create such a simple perspective. No point of view is superior to any others. Therefore, a commonly shared perspective never can be achieved because there is no possibility of evaluating competing views. For instance, if we as sociologists want to know something about society, we are accustomed to searching for sociological knowledge. According to Luhmann's argument, it also would be possible to read a newspaper, read a book, watch television, or speak with a friend. Any of these methods is a legitimate way of obtaining information about society. Neither science, nor any other

[8] After the original publication of *Social Systems* (1984/1995), Luhmann deepened and applied his approach to various functional systems within the system of society, such as the economy (Luhmann, 1988), science (Luhmann, 1990), law (Luhmann, 1993), and art (Luhmann, 1995). He attempted to demonstrate the usefulness of his general theory for the analysis of any functionally differentiated system. He also discussed issues that cut across functional systems, especially the communication of ecological risks (Luhmann, 1986/1989) and the use of the general concept of risk (Luhmann, 1991).

system, has a privileged position. If no functional system has a superior position from which to observe and thus to describe society as a system, we have the problem of an unlimited variety of equally valid observations of society.

Luhmann (2002) tried to work out a way in which we can nevertheless arrive at knowledge of society. Society describes itself through, for instance, legends and myths in ancient times and scientific knowledge in modern times. However, sociologists are able to observe these observations. And because sociologists are able to observe as second-order observers the first-order observations of society, they can draw conclusions about the relations between society and its semantics, that is, the self-descriptions of society. This is the key to knowledge about a society—to observe the semantics of society, that is, the "communication about the communications" constituting the system of society.

Luhmann attempted to demonstrate that the observation of society is not arbitrary because "there are structural conditions for the soundness of representation; and there are historical trends in the evolution of semantics strongly limiting the range of variation. Sociological theory is able to recognize connections of the kind of correlations between social structures and semantics" (1997:89; translated by one of the authors). Luhmann's studies reconstruct the historical usage and meaning of terms in relation to changing social structures, taking semantics as an expression of the interpretation of social structures. Thus, the proper way of observing society sociologically is an investigation of changing semantics in relation to changing social structures.[9] Luhmann did a great deal of work outlining the development, for instance, of the semantics of morality, individuality, law, knowledge (1980/1981/1989/1995), poetry (2001), and love (1982/1986). This method is part of a sociology of knowledge and can be used in the general task of the development of a theory of society.

Criticisms

In sum, Luhmann's theory of modern society and his concept of society are highly developed analytical tools that allow sociology to obtain a fresh perspective on current social problems in society (and in sociology). The general theory of evolution and differentiation, as well as Luhmann's thinking on specific systems such as science and the economy, open up new avenues of theory and research. The basic distinction between system and environment opens up the possibility of a new kind of interdisciplinary research based on the assumption that complexity is the overarching problem connecting the apparently separated realms of the natural and the human sciences (Luhmann, 1985).

There are a number of criticisms of Luhmann's system theory (Blühdorn, 2000), but we briefly mention only four of them:

First, many theorists, including Jurgen Habermas, have argued that what Luhmann sees as a necessary evolutionary development is, in fact, regressive and unnecessary. Society may in fact be developing into a closed system of functionally differentiated realms unable to act in the name of the social whole, but this is something

[9] This argumentation indicates an inconsistency in Luhmann's idea that I discuss in the concluding section.

to resist. Theories should be developed to help counter this trend, not, as Luhmann does, to make it appear inevitable.

Second, in Luhmann's theory, differentiation is the key to describing the development of society and the increasing complexity of social systems in dealing with their environments (Rasch, 2000). But we can also find two counterprocesses in contemporary society. One is de-differentiation (Lash, 1988), that is, a process of dissolving boundaries between social systems, for example, between high culture and popular culture. The other is interpenetration (R. Münch, 1987), that is, a process of building institutions to mediate between social systems. Luhmann's system theory tends to see these processes as antievolutionary since evolution is defined as increased differentiation. It is possible that Luhmann's theory could recognize de-differentiation and interpenetration as valid sources of evolutionary variability, but this would mean dropping the single-minded focus on differentiation that has proved so theoretically rewarding.

Third, Luhmann's theory seems limited in its ability to describe relations between systems. Not all systems appear to be as closed and autonomous as Luhmann assumes. Not only do some systems appear to translate each other's codes, but they sometimes incorporate other systems as their elements. Most obvious is the way in which the social system incorporates the psychic system. The meaning of a communication within the social system is not completely determined by the social system itself. Psychic systems (individuals) protest and restrict the meanings that are assigned to a particular communication. Luhmann is correct that the meaning of a communication is not simply the intention of the individual, but certainly the intention has some, albeit a complex, effect on the social meaning. The social system is not simply closed to the psychic system. Similarly, it is possible that an apparently autonomous system such as the political system can be reduced to the status of a subsystem of another system such as the economy. In that case, the code of the political system may be simply a variation on the code of the economic system.

Finally, Luhmann's system theory assumes a variety of equally valid views of society without the possibility of giving one priority over the others. (This resembles the position taken by the postmodern social theorist Lyotard [1984].) Nevertheless, Luhmann claims that we are able to develop a secure knowledge of society observing the semantics of the self-descriptions of society. This standpoint is inconsistent because it is not possible to claim both positions at once.

In spite of these and other weaknesses, Luhmann's system theory has emerged as one of the leading social theories as we move into the twenty-first century, and it has sparked a resurgence of interest in systems theory.

Summary

This chapter begins with some of Walter Buckley's early thoughts on the nature of systems theory. There are various gains to be derived from a sociological system theory, including a common vocabulary across hard sciences and various social sciences, applicability at both the micro and macro levels, analysis of the social world as a whole, a focus on processes, an integrative perspective, and a dynamic orientation.

A variety of principles of systems theory are discussed, including the degree to which systems are open or closed, tend to run down (entropy), tend to elaborate structures (negentropy), are characterized by feedback, and feature processes that help the system maintain itself (morphostasis) and grow (morphogenesis). Buckley applied systems theory to consciousness, interaction, and the sociocultural domain.

Today's most important systems theorist is Niklas Luhmann. Among other things, Luhmann sees systems as self-referencing, as contingent, and as always *less* complex than the environment. Systems must reduce complexity; they cannot be as complex as their environment or they would be overwhelmed and unable to function. Luhmann's most important contribution is his sense of systems as being autopoietic. That is, systems produce their own basic elements, they organize their own boundaries and the relationships among their internal structures, they are self-referential, and they are closed. It is the view of systems as autopoietic and closed to their environments that differentiates Luhmann's approach from that of earlier systems theorists. Two of the systems singled out for analysis by Luhmann are the social and the psychic systems. Social systems are plagued by the problem of double contingency—every communication must take into account how it is received, but how it is received depends on the receiver's estimation of the communicator. Because of this, communication is improbable, but social structures have developed to make communication more probable.

Luhmann is concerned with evolution involving three mechanisms—variation, selection, and stabilization. Modern society deals with the increasing complexity of its environment through a process of differentiation. Differentiation leads to increasing complexity of the system and allows for a greater ability to respond to the environment, as well as to faster evolution. Luhmann identifies four forms of differentiation—segmentary, stratificatory, center-periphery, and functional. It is the last that is the most complex form of differentiation and the one that dominates modern society. It allows for greater system flexibility, but if one functionally differentiated system fails to perform its function, the system as a whole may fail. Furthermore, it is possible that society will not have a functionally differentiated subsystem capable of handling an important problem.

Since Luhmann conceives of society as an all-encompassing system, a world-system, it can be observed only from within the system. No functional system has the right perspective; all perspectives are legitimate. Nonetheless, Luhmann seeks to accord priority to sociological knowledge by arguing that its task is the study of first-order observations of society (legends, myths, and so on).

Luhmann's theory has been subjected to a number of major criticisms, but it remains a powerful perspective in the early twenty-first century.